RHODORA, Vol. 102, No. 912, pp. 428–438, 2000

SYSTEMATIC NOTES ON THE OLD WORLD FERN GENUS *OLEANDRA*

ROLLA TRYON

Department of Biology, University of South Florida,
Tampa, FL 33620-5150
e-mail: Tryon@chuma.cas.usf.edu

ABSTRACT. A classification and key to Asian, Australian, and Pacific *Oleandra* is presented to complement studies of Pichi-Sermolli (Africa) and Tryon (the Americas). Six species are recognized in this large area. Many species that have been proposed are evidently local variants and not recognized here.

Key Words: Southeast Asia, Australia, Pacific, Oleandraceae, *Oleandra*, fern

Oleandra is one of the most distinctive genera of the Polypodiaceae (*sensu lato*). Its characters have been noted by Copeland (1947), Kramer (1990), Nayar and Bajpai (1976), Pichi-Sermolli (1965), Tryon (1997), and Tryon and Tryon (1982). Among the especially noteworthy characters of the genus are the long, parallel and simple veins (branched, if at all, at their base), the occurrence of rhizophores (or unusual roots), the peltate stem scales, and the articulated petiole. The glaucous coating on the stem of nearly all of the specimens needs to be chemically studied.

The relationship of *Oleandra* is rather obscure in spite of several reports that have considered this: Nayar and Bajpai (1976), Ogura (1938), Sen and Sen (1973), Seong (1977), Tryon and Lugardon (1991), Hasabe et al. (1995), and Pichi-Sermolli (1965), who noted: "*Oleandra* differs from the other genera of the Filicidae in many features and this is the reason why its taxonomical position is debated."

There are about 35 accepted species in the region concerned, while only six are recognized in this study. Some general commentaries concerning the conservative assessment of species in *Oleandra* are pertinent here. The characters of a species must be those of a population, or of a series of populations, not of single plants. The characters must be distinctive over a significant geographic area. Minor variations may develop in *Oleandra* in isolated areas. Copeland (1958) notes under *O. columbrina*, "The

Palawan specimen is fairly typical. Otherwise, each region or mountain has its own recognizable strain." Plants may also have some morphological features that relate to different environments. Pichi-Sermolli (1965) remarked on the variable African species *O. distenta*: "This polymorphism is probably the result of great ecological plasticity of the species which may grow in very dissimilar habitats." Minor variants may deserve some kind of recognition, but not at the rank of species. Characters such as the shape of the apex or base of the lamina and the distribution and density of trichomes on the lamina are not sufficient to warrant the recognition of species.

This study has involved ca. 400 collections from the wide region concerned. It is based on the collections at the Harvard University Herbaria (HUH) and the New York Botanical Garden (NY). It is not concerned with the details of distribution, or nomenclature, or of taxonomy within the six species recognized. The sequence of species has no evolutionary implications except as the key may illustrate affinities; synonyms are listed only where there is relative certainty of their status.

This treatment may serve as a prodromus that may be amplified or revised by a study of holotypes and of populations in the field.

Oleandra Cav., Anal. Hist. Nat. 1: 115. 1799. Type and sole species: *Oleandra neriformis* (= *O. neriiformis*).

Neuronia D. Don, Prod. Fl. Nepal. 6. 1825. Type and sole species: *Neuronia asplenioides* D. Don (= *Oleandra Wallichii*).

Ophiopteris Reinw., Syll. Pl. Nov. 2: 3. 1825. Type and sole species: *Ophiopteris verticillata* Reinw. (= *Oleandra neriiformis*).

Aspidium subgenus *Oleandra* (Cav.) Splitg., Tidjs. Nat. Gesch. 7: 411. 1848.

KEY TO ASIAN, AUSTRALIAN, AND PACIFIC SPECIES

1. Leaves and phyllopodia borne on all sides of the aerial stem and its branches, often in clusters (i.e., pseudowhorls); the aerial stem with few or no rhizophores; a long internode of the aerial stem a straight continuation, or nearly so, of the long internode below ..... (2)
2. Leaves monomorphic or nearly so; sori ca. halfway between the costa and the margin of the lamina, or closer to the costa ..... 1. *O. neriiformis*

2. Leaves strongly dimorphic; the fertile lamina much narrower than the sterile, 3–7 mm wide in the middle (rarely more), and also usually much longer; sori near the margin of the lamina, the indusia often extending beyond the margin ..... 2. *O. Werneri*

1. Leaves and phyllopodia borne only on the upper side of the aerial stem, well-spaced or in clusters (pseudowhorls); aerial stem with rhizophores on the lower side; the aerial stem often arcuate beyond the leaf-bearing region, divergent in orientation from the long internode below. (see Fig. 4) ..... (3)

3. Stem scales closely imbricate and usually appressed, concealing the stem, bicolorous (marginate) beyond the point of attachment ..... (4)

4. Phyllopodia mostly less than 1 cm long (sometimes almost absent), often concealed by scales; lamina more than 5 times as long as the petiole, often 10 times as long or more ..... (5)

5. Stem with the scales mostly straight and appressed ..... 3. *O. musifolia*

5. Stem more or less squarrose-paleaceous, scales then with a reflexed tip ..... 4. *O. Wallichii*

4. Phyllopodia mostly over 1 cm long, often 5 cm long or more, not concealed by scales; lamina up to 5 times as long as the petiole ..... 5. *O. undulata*

3. Stem with the scales irregularly patent, somewhat thinly investing the visible stem, concolorous or nearly so and light brown to reddish brown beyond the point of attachment ..... 6. *O. Sibbaldii*

1. Oleandra neriiformis Cav., originally as *neriformis* Figures 1, 2.

Aspidium bantamense Blume, *A. pistillare* Swartz, *Blechnum colubrinum* Blanco, *Oleandra angusta* Copel., *O. Archbaldii* Copel., *O. bantamense* (Blume) Kunze, *O. ciliata* Kuhn, *O. Clemensiae* Copel., *O. colubrina* (Blanco) Copel., *O. cuspidata* Baker, *O. Herrei* Copel., *O. hirtella* Kunze, *O. lanceolata* Copel., *O. maquilingensis* Copel., *O. mollis* C. Presl, *O. nitida* (Copel.) Copel., *O. Parksii* Copel., *O. pistillaris* (Sw.) C. Chr., *O. platybasis* Copel., and *Ophiopteris verticillata* Reinw.

The application of the earliest name remained in doubt until

Figure 1. Habit of *Oleandra neriiformis,* terminal portion of erect stem, × ca. 1/4, adapted from *Kalkman 4005* (A), New Guinea.

Christensen (1937) published on the original material at Madrid. This is the most abundant and most widely distributed species among those treated. Distinctive characters are the radially symmetrical aerial stem, the monomorphic leaves, and the sori that are borne away from the margin. Merrill (1918) and Price (1973)

Figures 2–4. 2. Portion of a stem of *Oleandra neriiformis,* with many phyllopodia, × 1/2, *Webster 14181* (GH), Fiji. 3. *Oleandra Werneri,* portion of sterile lamina (left) and fertile lamina (right), both × 1, *Brass 12841* (A), New Guinea. 4. Arcuate internode of *O. musifolia,* base of petioles (above, at left), × 1, *Molesworth-Allen 2418* (A), Sumatra.

both treated *Blechnum colubrinum* (*Oleandra colubrina*) as a synonym of *O. neriiformis.*

Oleandra cuspidata was considered a valid species by Copeland (1940) who noted characters of the species as: "indusium small and fugacious" and "minute and fugative, not to be de-

tected on most specimens in the herbarium." The material is probably not exindusiate, the size and persistence varies, and a small fugacious indusium may be undetected among the mature sporangia as Copeland indicated.

The above synonymy mostly involves the species of Copeland, mainly because he tended to recognize minor variants. This rationale may have value in evolutionary studies, but not in taxonomic studies. In his Samoa study, Christensen (1943) rightly indicated, "After a careful examination of numerous specimens I find the differences between the forms, briefly characterized below, rather insignificant and inconstant, and I do not hesitate to refer them all to *Oleandra neriiformis* and to refer Copeland's three Fijian species to the same. The forms run together and even a grouping of the forms is difficult."

Among the specimens of *Oleandra neriiformis* that I have seen, the following are variants toward *O. Werneri*: *Brass 5466,* New Guinea (GH, NY); *Brass 31002,* New Guinea (GH); Rosenstock Exssic. *132,* New Guinea (GH, NY); and *Kajewski 537,* New Hebrides (GH).

The species is usually terrestrial or epiphytic, but sometimes lithophytic. When terrestrial, the erect aerial stems may grow to 2 m in height although they are usually 1–1.5 m tall, and they have a shrublike habit. The habit of the species when it grows as an epiphyte is uncertain. It grows from 50–2200 m, mostly above 1000 m, in northern India and southwest China (Yunnan), Burma, Vietnam, Malaysia and through Indonesia to the Philippine Islands and to New Guinea, and in the Pacific to American Samoa.

2. Oleandra Werneri Rosenst. Figure 3.

Oleandra dimorpha Copel. and *O. subdimorpha* Copel.

The strongly dimorphic leaves and the very narrow, long and falcate fertile leaves make this a distinctive species. The radially symmetrical aerial stem (and presumably the creeping underground stem) link this species with *Oleandra neriiformis.* The fertile lamina is usually more than twice as long as the sterile one. Sometimes the indusia project beyond the sterile tissue, which may be reduced, especially toward the base of the fertile lamina.

The specimen *Van Royen 3644* (A), from New Guinea, has only several fertile leaves, the sori are somewhat back of the margin,

and the fertile lamina is shorter and broader than usual in this species. In the latter two characters this resembles *Oleandra subdimorpha*. This specimen and some others with aberrant fertile leaves: *Brass 2916*, Solomon Islands (GH) and *Brass 6886, 11870*, both New Guinea (GH), may represent hybrids with *O. neriiformis* or, more likely represent variants of *O. Werneri*.

The species is epiphytic, rarely terrestrial, and it grows from ca. 50–1800 m, usually above 1200 m, in New Guinea, New Ireland, New Britain, and San Cristoval (Solomon Islands).

3. Oleandra musifolia (Blume) Kunze, originally as *musaefolia*. Figure 4.

Aspidium Moritzii Kunze, *A. musifolium* Blume, *Oleandra benguetensis* Copel., *O. hainanensis* Ching and Wang, *O. Moritzii* (Kunze) Kunze, *O. scandens* Copel., and *O. Wangii* Ching.

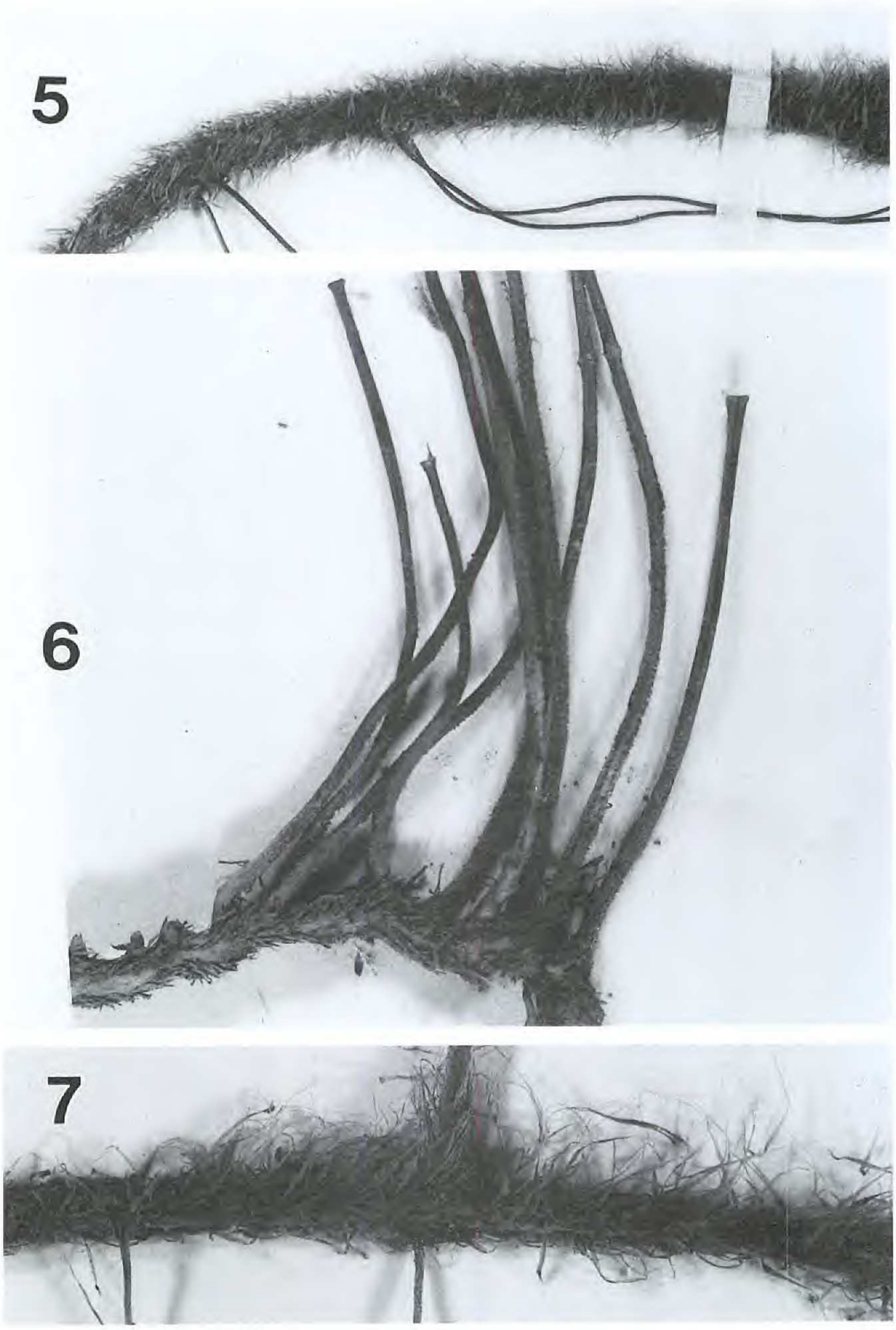
The species is characterized by the long and arcuate, dorsiventral aerial stems with their scales straight and fully appressed, and by the short phyllopodia that are usually concealed by the scales. Relations, based on the dorsiventral stems, seem to be with *Oleandra Wallichii*, a species often of higher altitudes. Similarity is also shown with *O. undulata*, a terrestrial species also with dorsiventral stems. *Oleandra musifolia* may possibly be a progenitor of these two.

The species is usually lithophytic, but sometimes terrestrial or epiphytic. It grows from 250–1800 m in northwestern India and Nepal, southeastern China, to southern India and Sri Lanka (Ceylon), through Indonesia (Sumatra to Timor), also the Philippine Islands, Thailand (Siam), and northeastern Australia (Queensland).

4. Oleandra Wallichii (Hooker) C. Presl Figure 5.

Aspidium Wallichianum Bory ex Bérlanger, Voy. Bot. 2: 56. 1833 (*nom. superfl.* for *A. Wallichii* and with the same type; the illustration, Pl. 5, is clearly *Oleandra neriiformis*; not Sprengel, 1827). *Aspidium Wallichii* Hooker, *Neuronia asplenioides* D. Don (*nom. superfl.* for *A. wallichii* and with the same type).

This species has few synonyms, perhaps because it was described and figured early and the type material (*Wallich*, Nepal) was widely distributed. It is found at elevations nearly 1000 m higher than other species. The squarrose-paleaceous stems are



Figures 5–7. 5. Portion of squarrous-paleaceous stem of *Oleandra Wallichii, Feng 3307* (A), China. 6. Long phyllopodia of *O. undulata,* one phyllopodium at extreme right, one at left, others with part of the petiole, × 1, *Rock 2026* (NY), Burma. 7. Portion of stem of *O. Sibbaldii,* × 1, *Brass 29706* (A), New Guinea.

diagnostic for this species among its relations that have a dorsiventral stem.

Oleandra Wallichii grows as an epiphyte or a lithophyte at relatively high altitudes, 1100–3300 m, in the Himalayas of

northern India and China (Yunnan), to Assam, in the mountains of northern Vietnam, and in Taiwan.

5. Oleandra undulata (Willd.) Ching Figure 6.

Oleandra Cumingii J. Sm., *O. intermedia* Ching, *O. macrocarpa* C. Presl, *O. pubescens* Copel., and *Polypodium undulatum* Willd.

The application of the name follows Ching (1933), although it seems that the holotype, consisting of two sterile leaves, is not clearly identifiable. This taxon is tentatively kept at the rank of species with the expectation that as more material becomes available it can be distinguished more clearly from *Oleandra Wallichii*. The most distinctive form of *O. undulata* has a short, coriaceous lamina; the sori are near the costa; the base of the lamina is cuneate; and the phyllopodia are long. However, it is difficult to distinguish some variants that resemble *O. Wallichii*. The undulate margin of the leaf is not a useful character because the wavy condition is not uniform along the margin, and the character also occurs in other species. Holttum (1968) has clarified the identity of *Cuming 60* (PRC). This material is a mixture; a fertile leaf with immature sori is clearly *O. Cumingii*, while a fertile leaf with large mature sori is *O. macrocarpa*. The creeping, terrestrial habit of this species may be derived from *O. musifolia*.

The species is usually terrestrial, but sometimes it is a lithophyte or rarely an epiphyte. It occurs from 100–1100 m in China (Yunnan) to southern India, and eastward in Thailand (Siam), Laos and Malaysia, to the Philippine Islands.

6. Oleandra Sibbaldii Greville Figure 7.

Oleandra crassipes Copel., *O. gracilis* Copel., *O. vulpina* C. Chr., and *O. Whitmeei* Baker, originally as *Whitmei*.

This distinctive species is recognized by the light brown to reddish brown stem scales that are not appressed. Many of the scales are deciduous so that the stem surface may be exposed in some places. The species resembles *Oleandra Bradei* of Costa Rica in the deciduous character of the scales. Although *O. vulpina* has been considered as a possibly exindusiate species, it is treated here as a synonym of the indusiate *O. Sibbaldii*. A small, fugacious indusium may be undetected among mature sporangia. The sheet of *Craven and Schodde 1123* (A) probably represents a hybrid with *O. Werneri* as shown by the sori near the margin and the fertile leaves longer than the sterile ones.

Plants are usually epiphytic, or rarely terrestrial, from 950–2450 m, mostly above 1200 m. It is found in the Philippine Islands, Celebes (Sulawesi), Borneo Island, New Guinea, and eastward in the Pacific to Tahiti and the Marquesas.

ACKNOWLEDGMENTS. I am most appreciative of the loan of specimens by authorities of the Harvard University Herbaria and the New York Botanical Garden; also for the use of the HUH Library and the help there of Judith Warnement. I am indebted to Betty Loraamm for the photographs illustrating details of the plants, to Lynda Chandler for the drawing of *Oleandra neriiformis,* and to Alice Tryon who has been helpful in many ways.

LITERATURE CITED

CHING, R. C. 1933. Notes on the herbarium Willdenow. Lingnan Sci. J. 12: 565–570.

CHRISTENSEN, C. 1937. Taxonomic fern studies, III. Dansk Bot. Ark. 9 (3): 1–32.

———. 1943. A revision of the pteridophyta of Samoa. Bull. Bishop Mus. 177: 3–138.

COPELAND, E. B. 1940. Oleandrid ferns (Davalliaceae) of New Guinea. Philipp. J. Sci. 73: 345–357.

———. 1947. Genera Filicum. Chronica Botanica, Waltham, MA.

———. 1958. Fern Flora of the Philippines. 1: 1–191. Bureau of Printing, Manila, Philippines.

HASABE, M. ET AL. 1995. Fern phylogeny based on rbcl nucleotide sequences. Amer. Fern J. 85: 134–181.

HOLTTUM, R. E. 1968. A commentary on some type specimens of ferns in the herbarium of K. B. Presl. Novit. Bot. Inst. Bot. Univ. Carol. Prag. 3–57. [Published in 1969 according to Holttum, Fl. Males. Ser. II, Vol. 1(4): 262].

KRAMER, K. U. 1990. *Oleandra,* pp. 191–192. *In*: K. Kubitzki, gen. ed., The Families and Genera of Vascular Plants. Vol. 1: Pteridophytes and Gymnosperms. Springer-Verlag, Berlin.

MERRILL, E. D. 1918. Species Blancoanae. Bureau of Printing, Manila, Philippines.

NAYAR, B. K. AND N. BAJPAI. 1976. Morphology in relation to phylogeny of the Davallioid-Oleandroid group of ferns. Phytomorphology 26: 333–354.

OGURA, Y. 1938. Anatomy and morphology of *Oleandra Wallichii* (Hk.) Pr., with some notes on the affinities of the genus *Oleandra.* Jap. J. Bot. 9: 193–211.

PICHI-SERMOLLI, R. E. G. 1965. Adumbratio florae aethiopicae, 11. Oleandraceae. Webbia 20: 745–769.

PRICE, M. G. 1973. The pteridophytes described from Mount Makiling, Luzon. Philipp. Agric. 57: 37–48.

SEN, U. AND T. SEN. 1973. Anatomical relationships between the *Oleandra* and *Nephrolepis* groups. Bot. J. Linn. Soc. 67, Suppl. 1: 155–172.

SEONG, L. F. 1977. Scanning electron microscopical studies on the spores of pteridophytes. XI: the Family Oleandraceae. Gardens' Bull. 30: 101–110.

TRYON, A. AND B. LUGARDON. 1991. Spores of the Pteridophyta. Springer-Verlag, New York.

TRYON, R. 1997. Systematic notes on *Oleandra*. Rhodora 99: 335–343.

——— AND A. TRYON. 1982. Ferns and Allied Plants. Springer-Verlag, New York.